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TIN ROOFER'S HAND BOOK

NATIONAL ASSOCIATION OF MASTER SHEET METAL WORKERS

TIN ROOFER'S HANDBOOK

COMPILED BY THE
Joint Committee on Tin
Plate for the National
Association of Master
Sheet Metal Workers
of the United States

◆

ISSUED IN THE INTERESTS OF
GOOD TIN ROOFS

National Association of Master Sheet Metal Workers of the United States

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Principles
of the
National Association of Master Sheet Metal Workers

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Trade Protection

We are opposed to the manufacturers and jobbers selling direct to the consumer and shall use all fair means to break up the practice and shall give our preference in buying to those houses which sell to the trade only.

Open Shop

We believe it will be to the mutual advantage of employer, employee and skilled mechanic to have the open shop system.

Arbitration

We are opposed to strikes and lockouts, believing all difficulties between employer and employee should be adjusted by arbitration without cessation of work.

No Restriction of Apprenticeship

We favor the elimination of the restriction of apprenticeship, believing that every boy in America should have the opportunity to learn a trade.

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PHILADELPHIA

Introduction

In the early days of the tin roofing business, when all tinplate was imported, there were only a few standard brands of known and serviceable quality, and there was only one way—the right way—of putting on a tin roof. The subject was comparatively simple, and one with which roofers and architects were thoroughly familiar.

In modern times the methods of manufacture, the qualities and kinds of materials employed, the conditions under which tinplate is used, and the names, and the brands and trade terms, have so multiplied as to be perplexing to many, both in and out of the roofing trade.

There is therefore the need of a technical, practical handbook containing full information about tin roofing, and it is with the view of meeting this need that this little book is issued.

Tin Roofing

A Brief History

Although the manufacture of tinplate appears to have been carried on first in Bohemia about the Thirteenth Century, Great Britain deserves the credit for having improved and developed the art of covering black sheets of iron or steel with a protective coating of tin. About 1720 Major John Hanbury, of Pontypool, established the first permanent plant for the production of tinplate on British soil. As a matter of interest, the descendants of Major Hanbury are still engaged in the tinplate business in this country.

Roofing-tin was first made in the United States in an experimental way in Philadelphia, in 1830, but practically all of the tinplates used for roofing purposes up to 1891 were imported plates, the product of the Welsh mills.

The McKinley Tariff at this time encouraged the manufacture of tinplate in America to such an extent that many works promptly sprang up in various parts of the country. In many cases the Welsh processes were transferred bodily to the American works.

American ingenuity has caused the introduction of many labor-saving devices which have made it possible to produce tinplates quickly and cheaply, the increase in the use of cheap grades of tinplate for various manufacturing purposes following the reduced cost of such plates.

Unfortunately, much cheap terne plate has flooded the market, and in many cases this cheap tin has found its way on the roof, utterly failing to give the satisfaction expected of this form of roofing material.

American manufacturers can, and do, make tinplates that are fully the equal of any that have ever been made. They are equipped to make high-grade, durable roofing plates, and do make them for those who want them and are willing to pay the price.

The manufacture of high-grade roofing-tin in this country to-day is an important industry that deserves the support of the master sheet metal workers and others interested in the roofing trade.

It is not the purpose of this little book to enter into any discussion of the different methods or processes of the manufacture of tinplate, nor to go into the merits of any of the many grades or the different materials which may form the base, which are offered by the different manufacturers and jobbers to the roofing trade.

The thing that concerns the roofer most is the durability of the material after he has laid it on the roof.

It is absolutely necessary that the plate should carry sufficient coating to properly protect the base. The use of cheap, light-coated plates is not advised and should be discouraged.

The roofer should insist upon being paid a price which will enable him to use a heavily-coated plate and do a first-class piece of work. Cheap materials and poor workmanship will not build up a business but will bring the trade and those who engage in it into disrepute.

Tin as a roofing material has so many superior points of merit over every other kind of roofing, that it is only necessary for the roofer to present these to the prospective customer to win his case, although the first cost may be greater. It is not necessary to use cheap tin, nor other forms of roofing, to secure contracts, but it may often be necessary to point out the arguments in favor of good tin.

Advantages of a Good Tin Roof

Tinplate has been used for roofing material for so many years that it has been thoroughly tried and tested, and has proved its value as a roof covering. Good roofing-tin—the old-time, durable quality—is considered the standard roofing material for the highest class of buildings.

A good tin roof combines advantages that are not found in any other form of roof. It must be understood, however, that these statements apply only to good quality, heavily-coated, well-made tinplate. Tin is the natural covering for roofs. It has qualities possessed by no other metal or substance, which peculiarly fit it for roofing purposes. It is subject to less contraction and expansion than any other metal that can be used; it is adapted to more variations of climate than either copper, zinc or iron; in fact, climatic conditions are rarely a bar to its use. Only some local conditions peculiar to the building itself render its use impracticable. Its pliability, lightness, durability, cheapness, and the various climatic and other changes to which it is adapted, render its use a most natural one.

A good tin roof is light in weight; it requires only a very light roof construction, which is in itself a very marked saving in the cost of any building. Slate, tile and tar roofs are very heavy, as the following table of weights of roofing materials will show:

Weight per Square (100 Square Feet)

Tile (shingle) . . .	1200 to 1800 lbs.
Tile (Spanish) . . .	800 to 850 lbs.
Slate, 3/16 inch, good grade	650 to 700 lbs.
Four-Ply Slag . . .	525 to 575 lbs.
Three-Ply Slag . . .	350 to 450 lbs.
Shingles, spruce and pine	400 lbs.
Tin, IC thickness, standing seam	65 lbs.

A tin roof is perfectly clean: this is an important feature where the water from the roof is collected in cisterns. There is nothing injurious in the tin roof provided the paint used on it is harmless. Cistern-water from a tin roof is pure, clean and tasteless.

A tin roof is neat in appearance. Where laid with standing seams the effect is attractive, particularly where the crest of the roof is finished off with some simple design. Tin looks infinitely better than any prepared or composition roof.

A tin roof is easily put on; is adaptable to any surface, from a flat deck to a vertical wall. Note that tile, shingles, slate, etc., are only adapted to very steep slopes, and that tar-and-gravel and similar roofings must be laid flat, or they will melt and run, or "creep" in hot weather.

If a tin roof is damaged it can be repaired quickly and cheaply. There is no wholesale tearing up of the roof, as in the case of tar-and-gravel and composition roofings, to find the leak. A roofer can repair a leak in a tin roof permanently in a few minutes.

Tin is not affected by heat or cold: it is equally popular in the Northwestern regions and in the Southern States.

A good tin roof is the most weatherproof form of roofing that can be had at any cost. Wind and snow cannot sift through it, as with shingles, slate and tile. Heavy rain and moisture cannot get through it, as it covers the upper surface of the roof with an unbroken, continuous sheet of metal.

A tin roof is the best known protection against fire, excepting only reinforced concrete or hollow tile. Tests and actual experience in conflagrations have proved that the tin-covered wooden fire-door is the most effective bar to flames. Such doors have been adopted as the highest standard by the National Fire Protection Association. A tin roof gives the same protection to the upper part of the building. The wood may even char slightly under the tin in extreme cases where the heat is intense, but the fire cannot penetrate the unbroken sheet of metal.

Slate and tile roofs, whether laid on wood or on metal roof framing, will crack and fall when exposed to heat, laying bare the sheathing and the interior of the building, and rendering the work of firemen below extremely hazardous. Tar-and-gravel roofs, and similar built-up composition roofings containing pitch, tar and other bituminous compounds, are the worst fire-risk—excepting shingles—and are usually classed as such by insurance companies.

In the case of fire from within the building the tin roof acts as a blanket to the flames, and will often hold together intact when the roof supports burn through and collapse, smothering the flames and preventing the disastrous upward draft which often carries sparks and embers to a distance. This well-known feature of tin roofs is a great aid to firemen in fighting the flames.

Everything considered, it is the most durable roofing material that can be obtained. There is ample evidence in the files of this Association of tin roofs in good condition after upwards of eighty-five years' service, and these roofs are apparently good for an indefinite period to come. Where good tin is used, and the work done right, the roof can be expected to last as long as the building stands, with no further attention except an occasional coat of paint. As a rule, from five- to eight-year intervals are sufficient for subsequent painting, depending upon local conditions. With a good tin roof the intervals between paintings are about equal to the average life of a tar-and-gravel, slag, or composition roof. The roofs of cheap tin that fail to uphold this standard of durability only serve as a contrast to the value of good tin, properly put on.

A good tin roof is economical—it is an investment rather than an expense. A building covered with a roof that requires no repairs is worth more in buying and selling. The first cost of the tin roof is the only cost excepting the slight additional cost of an occasional coat of paint. We know of many 30-year roofs of good tin that have been painted only two or three times, and are in perfect condition. This item of painting represents only the reasonable attention that a good, first-class article deserves to keep it in perfect condition. Very little paint is required to cover tin, as it spreads out thin over the surface, and does not soak in.

Contrasted with other forms of roofing material a **good tin roof is**

Better than slate, which is heavy, cracks in extreme cold weather or under sudden changes of temperature; fades in color, is exceedingly difficult to repair, and can only be laid on very steep surfaces.

It is a curious fact that owing to the cheap quality of the nails used nowadays for slate, tile and shingle roofs, this is a weak point of such roofs, since rust soon attacks the nails, and when these rust through there is nothing to hold the heavy slates or tiles. The nails in a tin roof are completely protected from the weather, as the surface of the tin is continuous, without any cracks or interstices through which moisture can penetrate.

Better than tiles, which are difficult to lay tight, and admit wind and moisture, and are heavy, requiring extra strong roof construction.

Better than shingles which warp, rot out, split, absorb water and remain damp, and in hot, dry weather are easily set afire by a spark. Modern shingles are usually sawed instead of split, as in the old days, and do not last long. Like slate and tile, shingles are only adapted to steep roofs.

Better than gravel, slag, or composition roofs, which are made of perishable, inflammable materials. Such roofs are practicable only on very flat surfaces—less than three inches slope to the foot* —and are a constant menace from fire to the building they cover. Leaks in roofs of this kind are very difficult to trace and repair, as the water will often work for long distances between the courses of paper and felt. Such roofs are dirty and frequently clog the gutters and downspouts with tar and gravel. In case of fire they add fuel to the flames, and render the work of firemen doubly hazardous, from the burning pitch or tar which drips through to the lower floors and from the eaves. The extreme danger from fire with roofs of this class will be realized by noting the amount of highly inflammable material applied to every ten feet square:

A four-ply **tar-and-gravel roof** contains:

Tar........	120 lbs. per 100 sq. ft.
Felt.......	56 " " " "

Note further that paper and felt are perishable materials, and that tar and pitch, under the action of heat and cold and the weather, soon dry out, crack, and lose their waterproof value.

Better than any ready-made roofing—felts and paper and patent roll roofings, which are at best only temporary coverings, and which bag and buckle and look cheap and poor, and help to feed the flames in case of fire.

Better than copper, especially where put on in large expanses, as the great expansion and contraction of this metal under varying temperatures causes it to break apart at the seams. Copper is

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[*] See Report of Committee on Roofs and Roofings, Annual Meeting, National Fire Protection Association, New York, May 22, 23, 24, 1907.

inclined to "craze" and "creep" under certain conditions. We hear many complaints of the copper sold nowadays, which does not seem to have the weather-resisting qualities of the old-time metal obtained by cruder methods of smelting.

Better than zinc, which disintegrates on exposure to the atmosphere, particularly in salt air, along the seaboard.

Better than sheet-lead, which creeps and draws itself out thinner and thinner until it falls apart. Both zinc and lead will melt and run down under moderate heat, in cases of fire.

Everyone who has had experience with **good tin** roofs readily acknowledges these facts. The statements and attacks made against tin roofs by makers of other forms of roofing apply only to cheap roofing plates; such arguments and statements are not true of the old-time, heavily coated, well-made plates which have always given such excellent all-around satisfaction, where treated right.

Working Specifications

These Standard Specifications were adopted by the Trustees of the Association at the Semi-Annual Meeting in Philadelphia, February 20, 1907. Architects are requested to specify: "All tin work and tin roofing to be done in accordance with the Standard Specifications of the National Association of Master Sheet Metal Workers." This will save time and misunderstanding, and will insure good workmanship. Copies of the Specifications are always obtainable free from the President or Secretary of this Association.

Standard Specifications

Roof Incline:

(a) If flat-seam, roof to have an incline of ½ inch or more to the foot.

(b) If standing-seam, roof to have an incline of not less than 2 inches to the foot.

(c) Gutters, valleys, etc., to be designed with sufficient incline to prevent water standing in same, or backing up in any case far enough to reach standing-seams.

Note—Aside from better workmanship and the more general use of good materials in former years, one of the chief reasons for the durability of old-time roofs is the fact that they were, as a rule, designed with steep slopes, preventing any accumulation of water and dirt. Were all the tin on the roof to lie absolutely flat and smooth, a slight pitch would be sufficient to carry off the water, but the expansion and contraction of sheet-metal causes a slight waviness, which on a flat roof or in a flat gutter forms shallow depressions that hold the water and collect dirt.

It is well to avoid making deep gutters with steep sides, that fill with ice, and are often broken by freezing. Tin downspouts, if joined to a sewer system, should be connected on the house side of the sewer-trap, as the sewer-gas has been known to cause trouble.

Sheathing-Boards. These shall be of good, well-seasoned dry lumber, narrow widths preferred, free from holes, and of even thickness. Boards to be laid with tight joints, or tongued and grooved, nail-heads well driven in. Green hemlock, chestnut, oak and ash are not recommended.

Note—It is bad practice to lay a new tin roof over old rotten shingle, or tar roofs. Rotting wood in contact with tin is liable to cause trouble. The same thing may be said of rotten, or rust-saturated roof-boards.

Sheathing-Paper. Not necessary where the sheathing-boards are laid as specified above; if used, to be waterproof. No tar-paper or others containing acids allowed.

Note—Tar-paper, pitch, and similar substances should never be allowed to come in contact with tin roofing. If any sheathing-paper is used it should be of a good, waterproof quality.

All Seams, whether locked or standing, shall be made according to the accompanying diagrams. (See pages 17 and 19.) No nails shall be driven through the sheets.

Flat Seam. If the sheets are laid singly, the size shall be 14 x 20. The sheets shall be fastened to the sheathing-boards by cleats, using three to each sheet, two on the long side, one on the short side. Two 1-inch barbed wire nails to each cleat (see Fig. 2), no nails to be driven through the sheets. If put on in rolls, the sheets shall be made up into long lengths in the shop; the cross seams locked together and well soaked with solder. The rolls shall be applied the narrow way, fastened to the roof with cleats spaced 8 inches apart, cleats locked into the seam and fastened to the roof with two 1-inch barbed wire nails to each cleat (see Figs. 1-5).

Note—Many roofers prefer to use IX thickness for the entire roof: it makes a particularly fine, first-class roof. Many roofers also prefer 14 x 20 inch sheets for all work, as there is less tendency to buckle or rattle. This size is

Flat-Seam Roofing

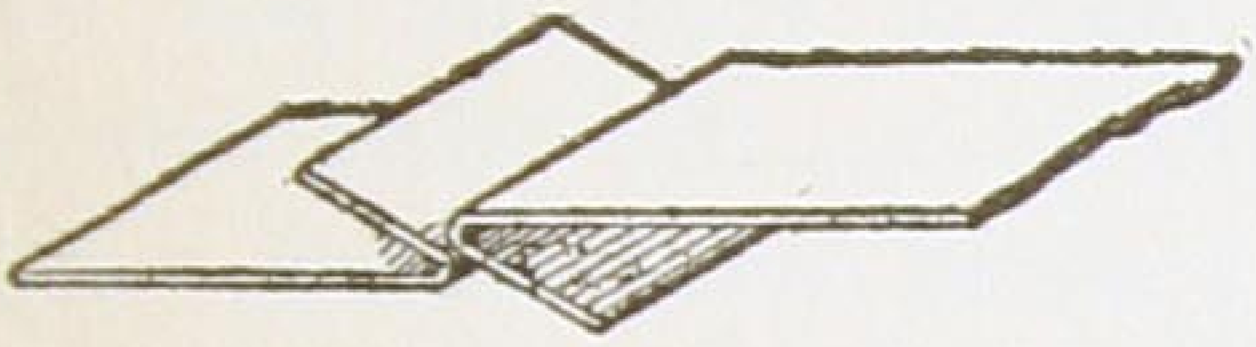

Fig. 1. First step; edges turned over

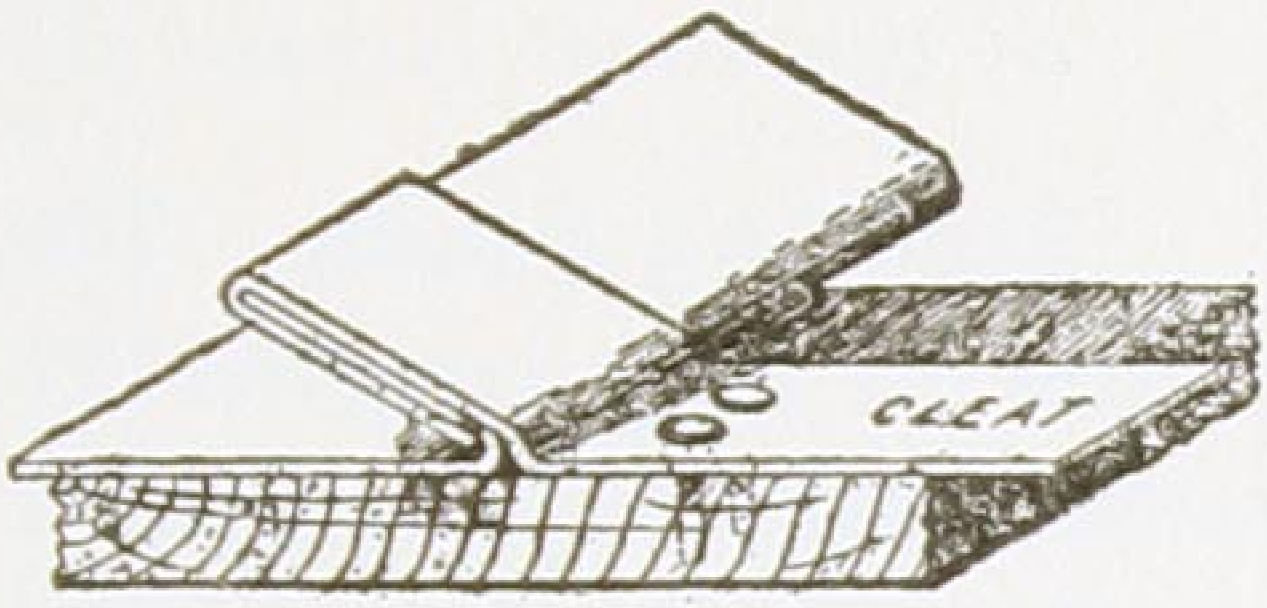

Fig. 2. Cleat inserted

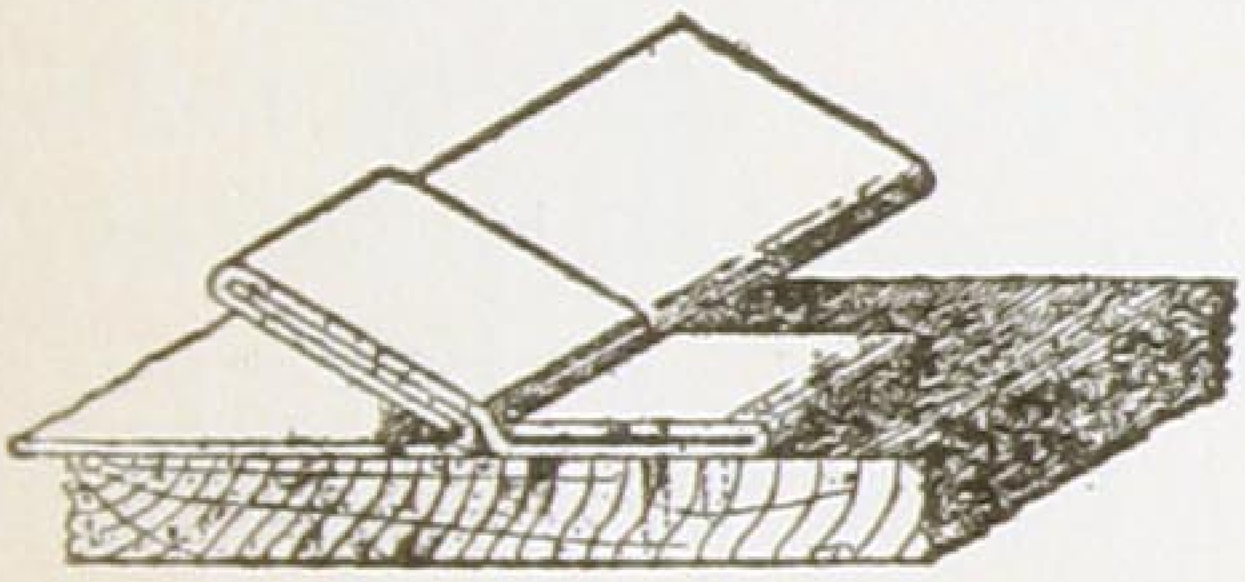

Fig. 3. End of cleat turned over nail-heads

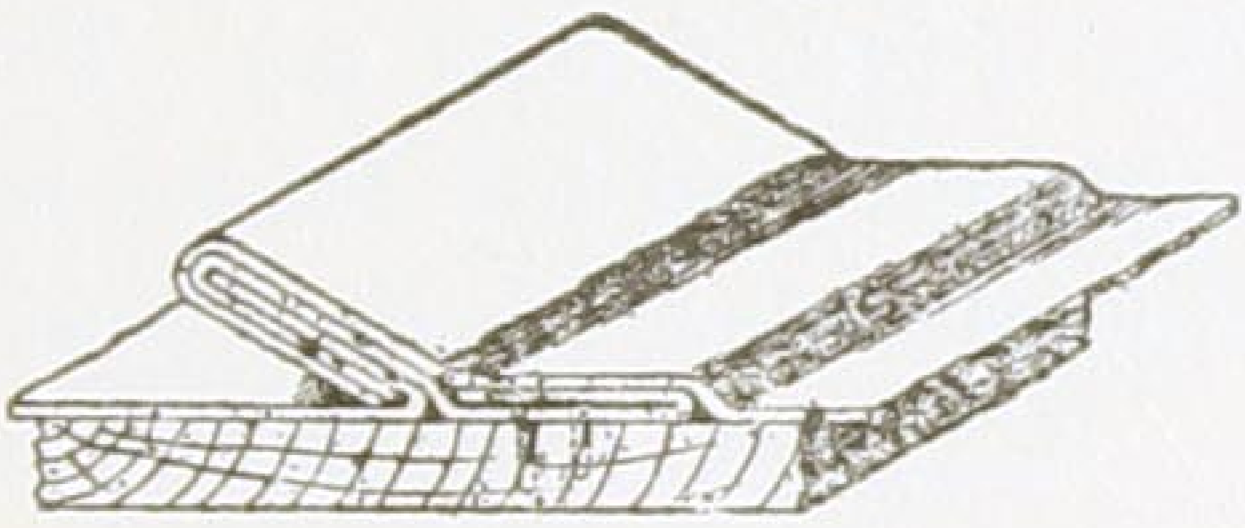

Fig. 4. Adjoining sheet in position

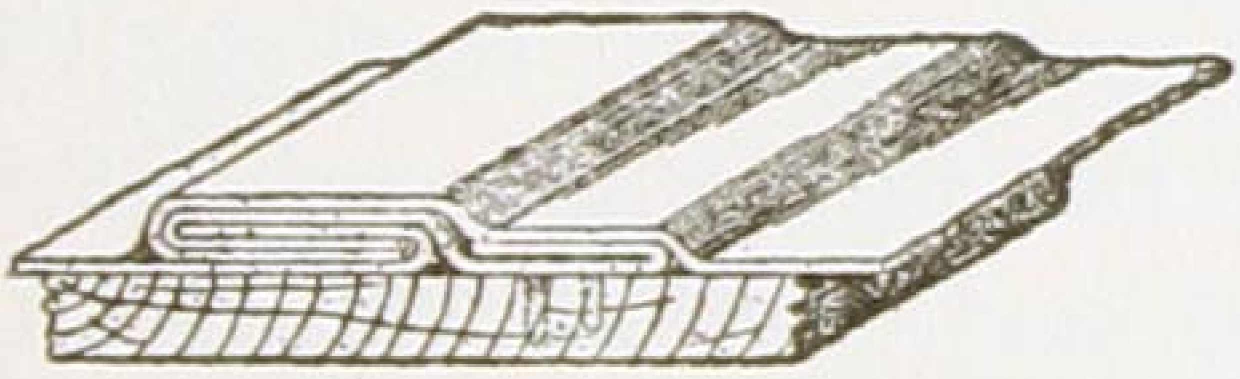

Fig. 5. Flat seam finished, showing cleat

also preferred for valleys and gutters. The larger size, 28 x 20 inch, is more desirable for standing seam work, where a considerable part of the sheet is used for forming the seams.

Standing-Seam. The sheets shall be put together in long lengths in the shop, the cross seams locked together and well soaked with solder. All standing-seam roofing shall be applied the narrow way, fastened with cleats spaced one foot apart. One edge of the course shall be turned up 1¼ inches at a right angle, when the cleats shall be installed. (See Figs. 7 and 8.) The next course shall have the adjoining edge turned up 1½ inches. (See Figs. 6 and 9.) These edges shall be locked together, and the seams so formed shall be flattened to a rounded edge. (See Figs. 10, 11 and 12.)

Valleys and Gutters. To be of IX tin and formed with flat seams, using sheets the narrow way.

Flashings. Wherever practicable, flashing shall be let into the joints of the brick or stone work and cemented. If counter-flashings are used, the lower edge of the counter part shall be kept at least three inches above the roof.

All Solder used on this roof shall be of the best grade, bearing the manufacturer's name, and guaranteed one-half and one-half (one-half tin and one-half lead), using nothing but rosin as a flux. Solder to be well sweated into all seams and joints.

Note—The terms "half-and-half" and "100 to 100" solder mean very little nowadays unless the proportions are guaranteed, and only new metals used.

Painting. All painting to be done by the roofer. Before laying, all tin to be painted one

Standing-Seam Roofing

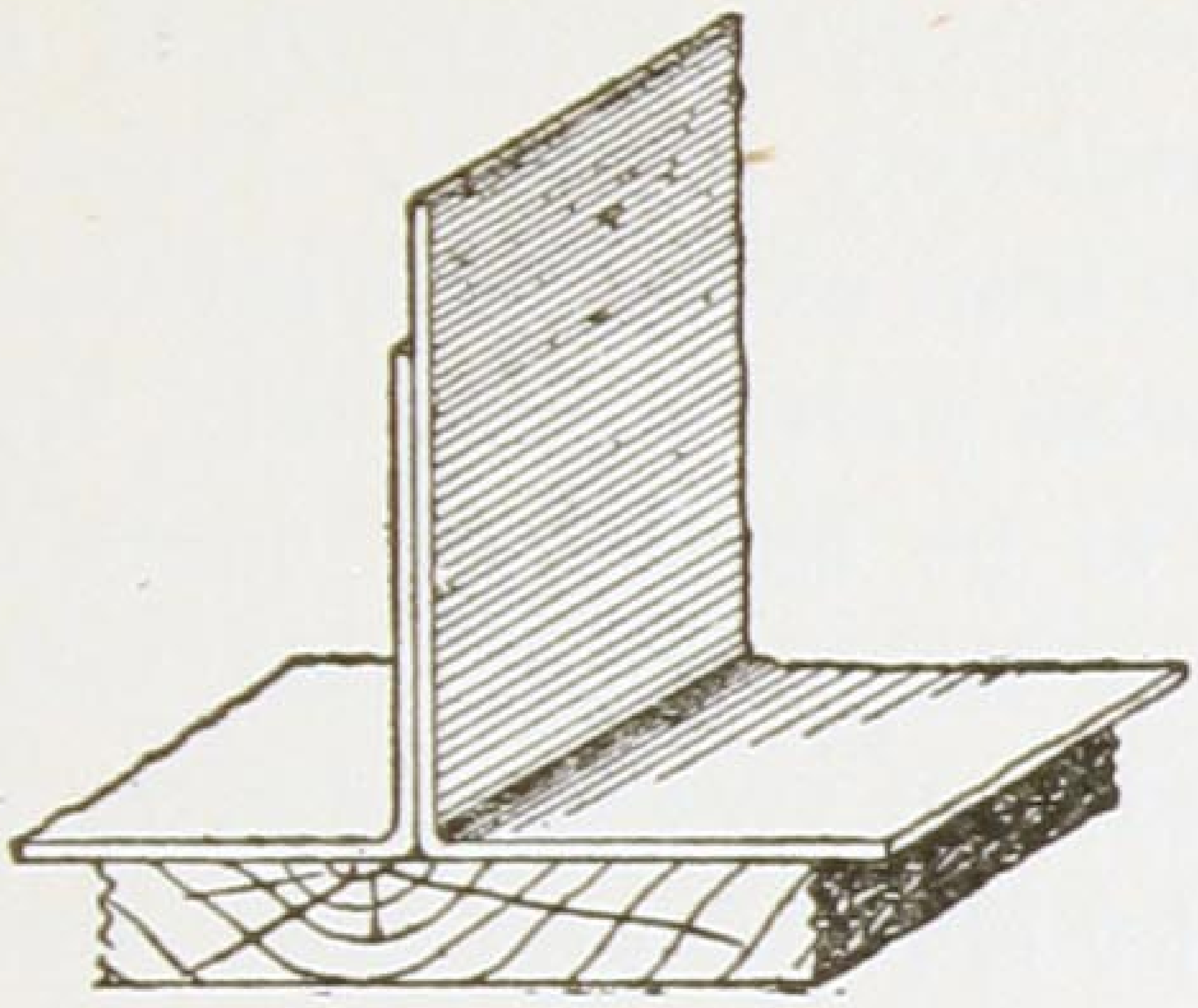

Fig. 6. Adjoining edges turned up

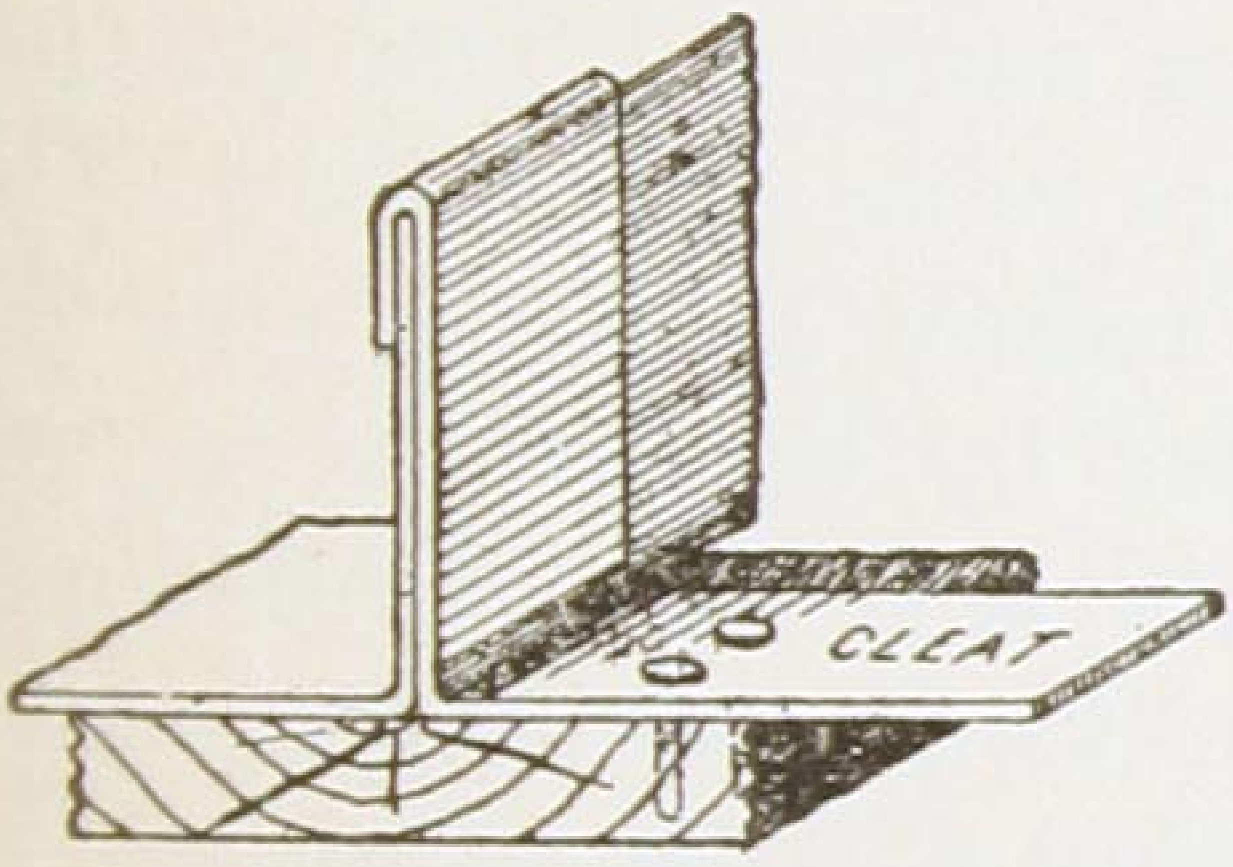

Fig. 7. Cleat inserted

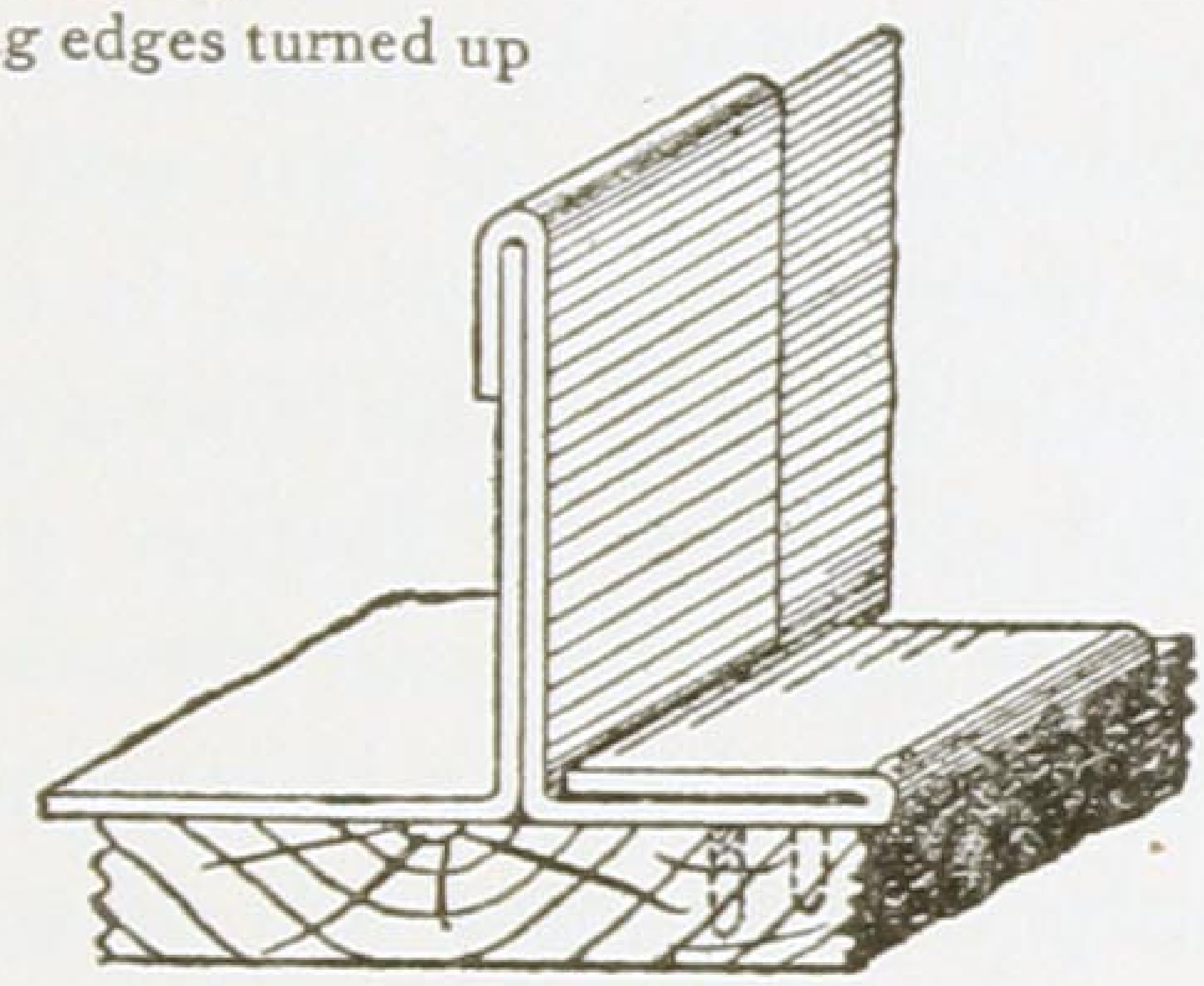

Fig. 8. End of cleat turned over nail-heads

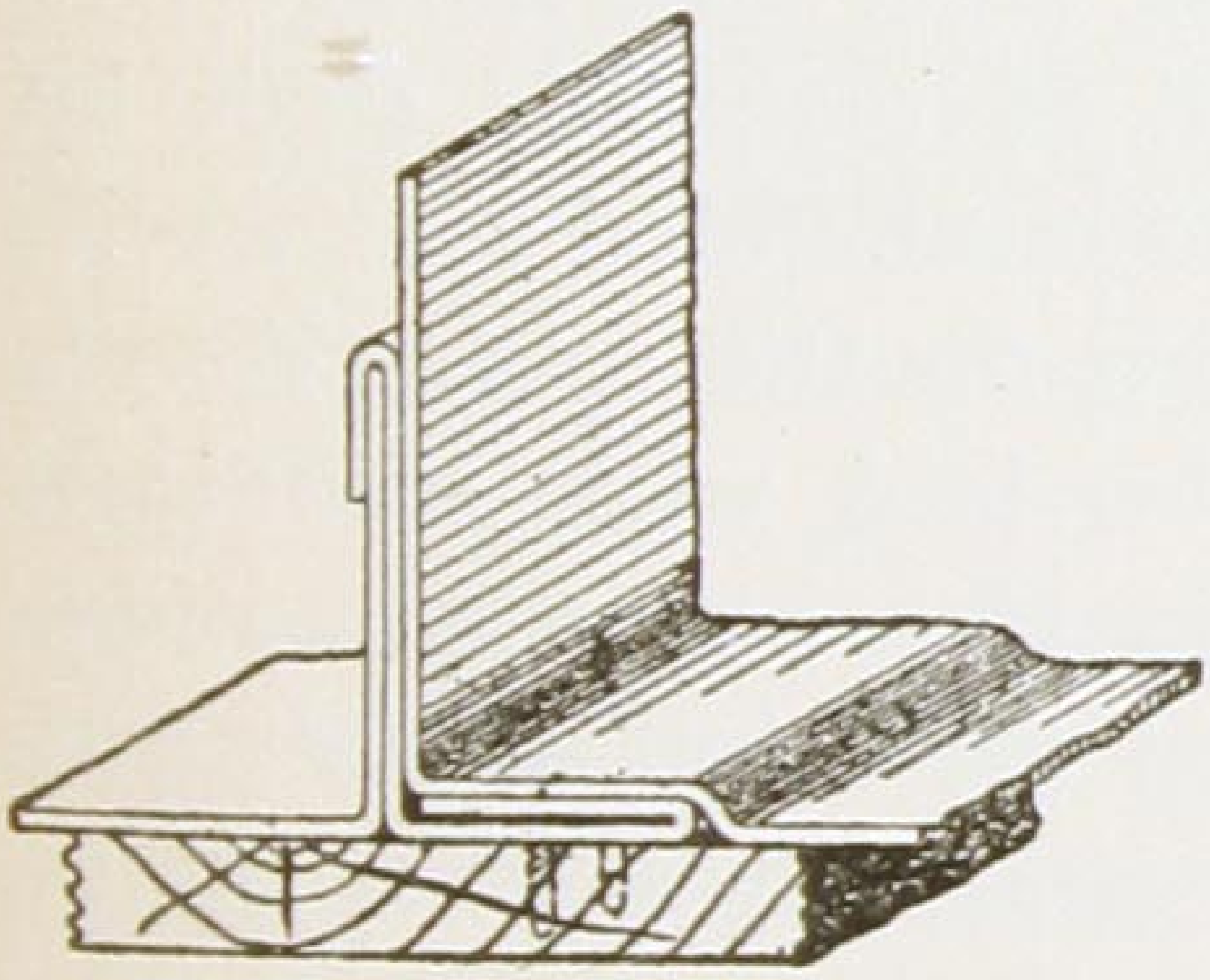

Fig. 9. Adjoining sheet in position

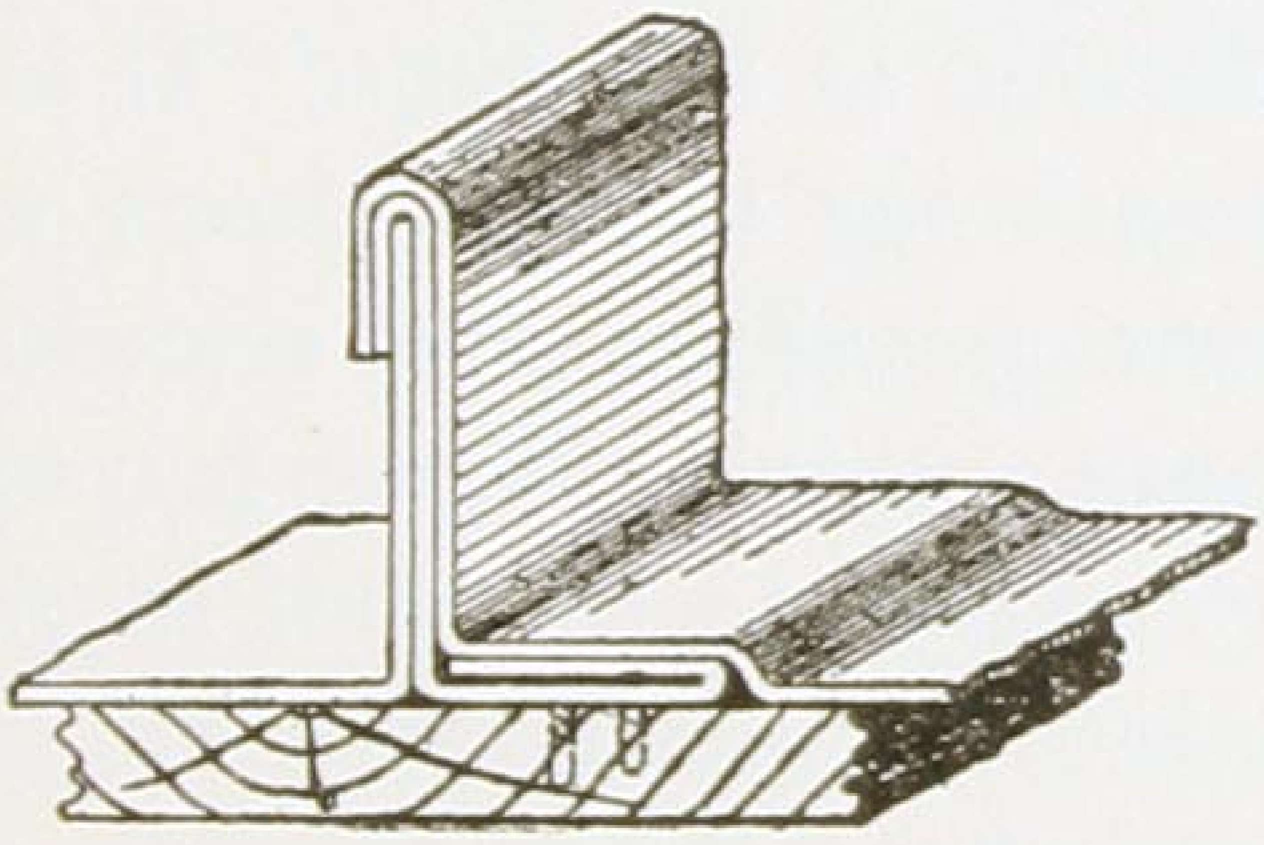

Fig. 10. First step in forming lock; top of sheet turned over

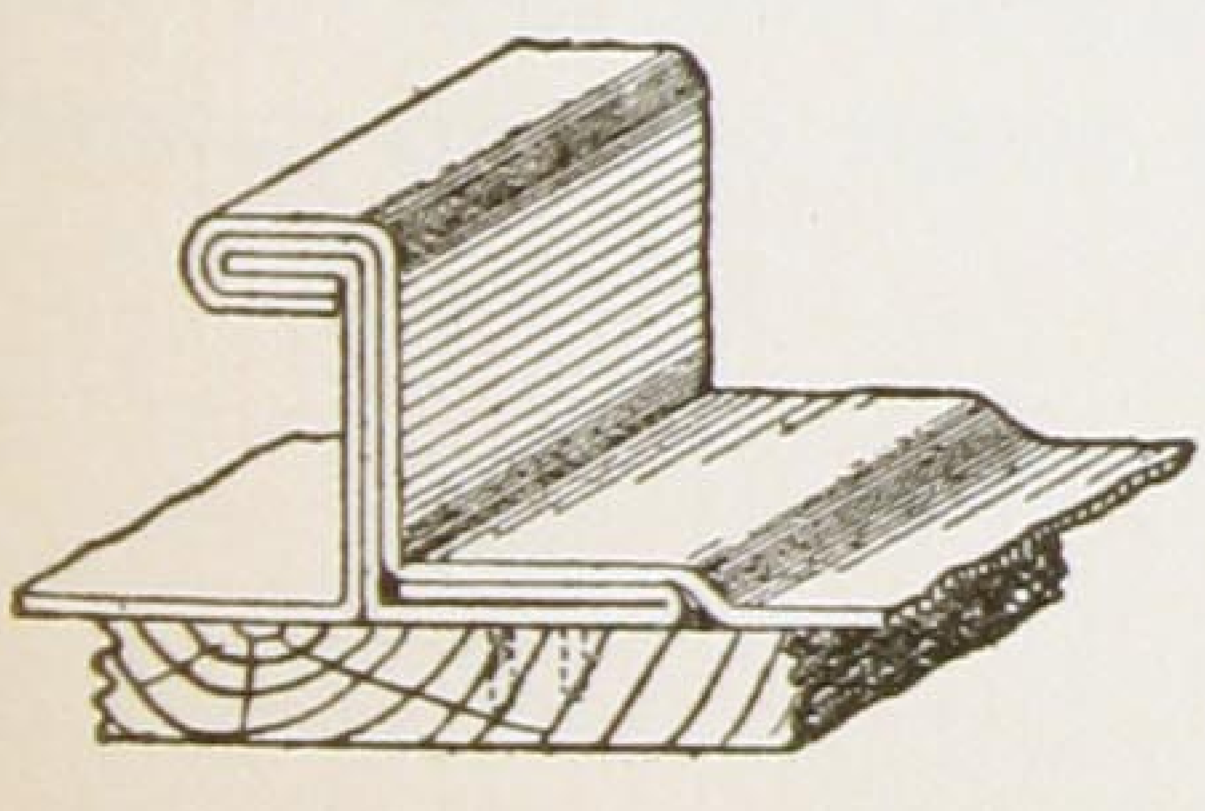

Fig. 11. Second step, showing seam turned half over

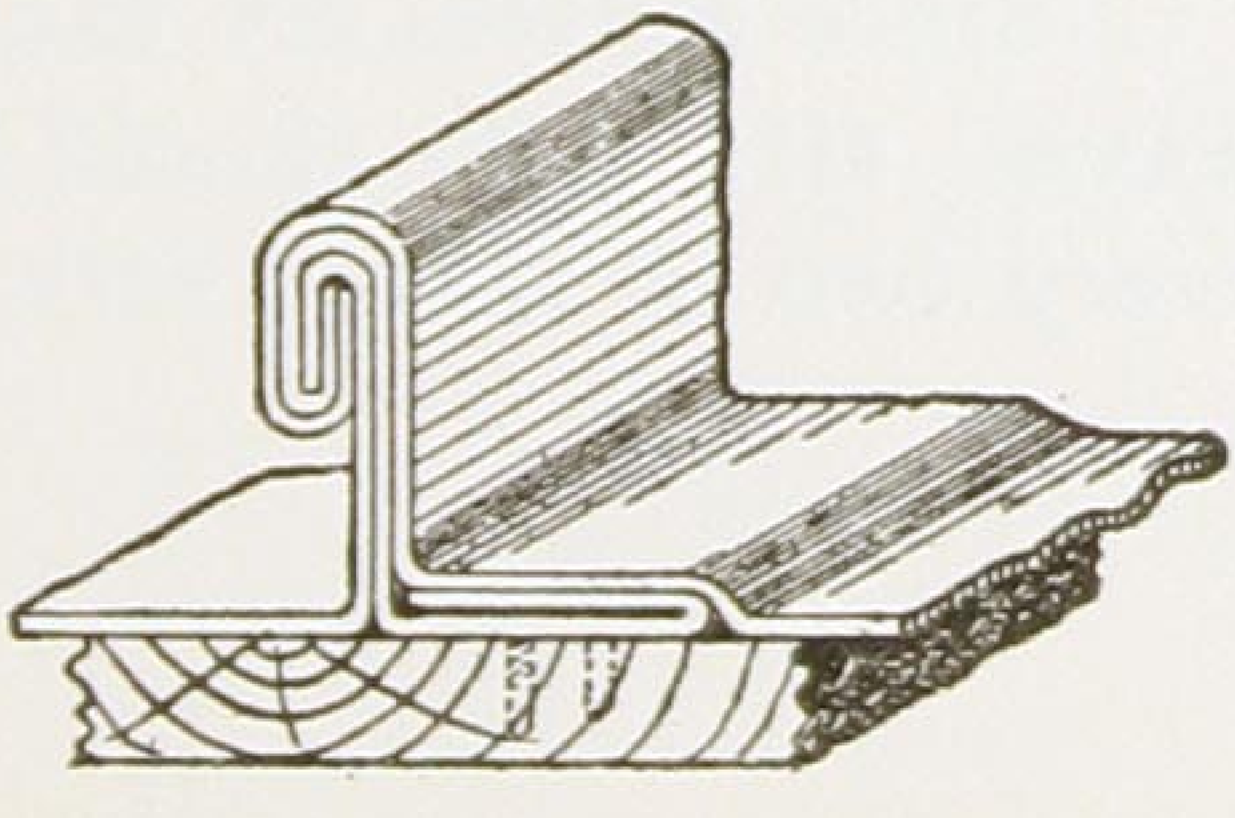

Fig. 12. Standing seam finished, showing cleat

coat on the under side. The upper surface of the tin roof to be carefully cleaned of all rosin, dirt, etc., and immediately painted. Paint to be of pure metallic brown iron oxide, or Venetian red as a pigment, mixed with pure linseed oil. No patent dryer or turpentine to be used. All coats of paint to be applied with a hand-brush and well rubbed on. Apply a second coat two weeks after the first. The third coat to be applied one year later.

General Instructions. No substitution of a cheaper grade of tin will be allowed. The object of these specifications is to provide tin roofs of the same durable, satisfactory nature as those generally obtained in former years by the use of high-grade material and thorough, first-class workmanship. The roofer is expected to do good work, and only a first-class job of roofing will be accepted.

No unnecessary walking over the tin roof, or using the same for storage of materials shall be allowed at any time. It is recommended that workmen wear rubber shoes when on the roof. Wherever possible, tin should be laid with standing-seam, which allows for expansion and contraction.

To keep the roof in good condition, subsequent painting will hardly be necessary at shorter intervals than three to five years' time, even longer, depending upon local conditions.

Since gutters are the natural receptacle for dirt, leaves, etc., they should be swept out and painted every two or three years.

Practical Hints

Look over the roof before you start to lay the tin, and if there is anything wrong with the slope of the gutters or the quality of the sheathing-boards, etc., report it to the architect before you start the work. Trouble with the roof arising from these causes may later be blamed on you.

See that the downspouts and gutters are designed to be of ample capacity for heavy rains.

Keep a record of the roofs you put on and see that they are kept painted from time to time, and gutters and valleys cleaned out.

Keep a pail of water handy on the roof to cool soldering-coppers, if too hot.

Move the fire-pot about from time to time to prevent continuous walking to and fro in one place.

A handy frame and guide for painting single sheets to within a short distance of the edge can be made as shown on the next page. The sheet is laid in the frame, and the guide—a shallow box, made as shown in the illustration—is placed over it. This will enable the painter to paint the whole surface of the sheet except one-half inch of the edge.

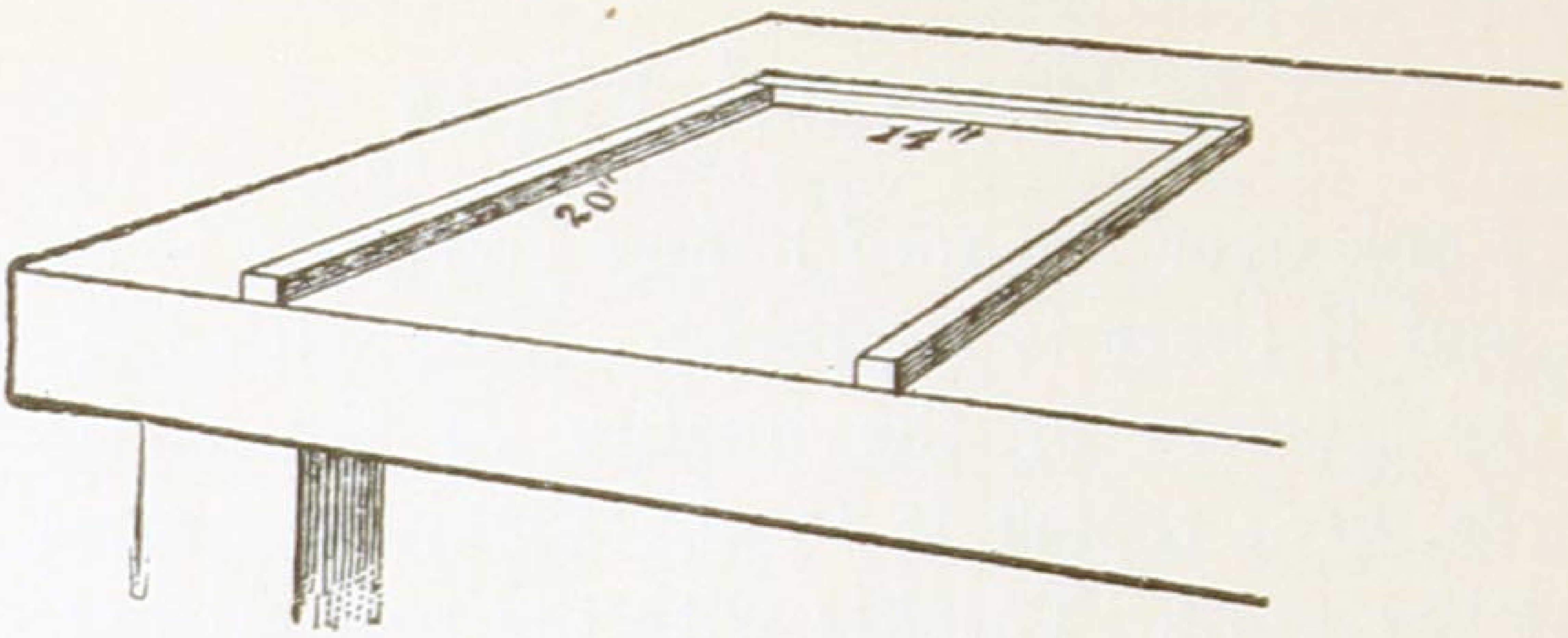

Fig. A Frame for painting sheets

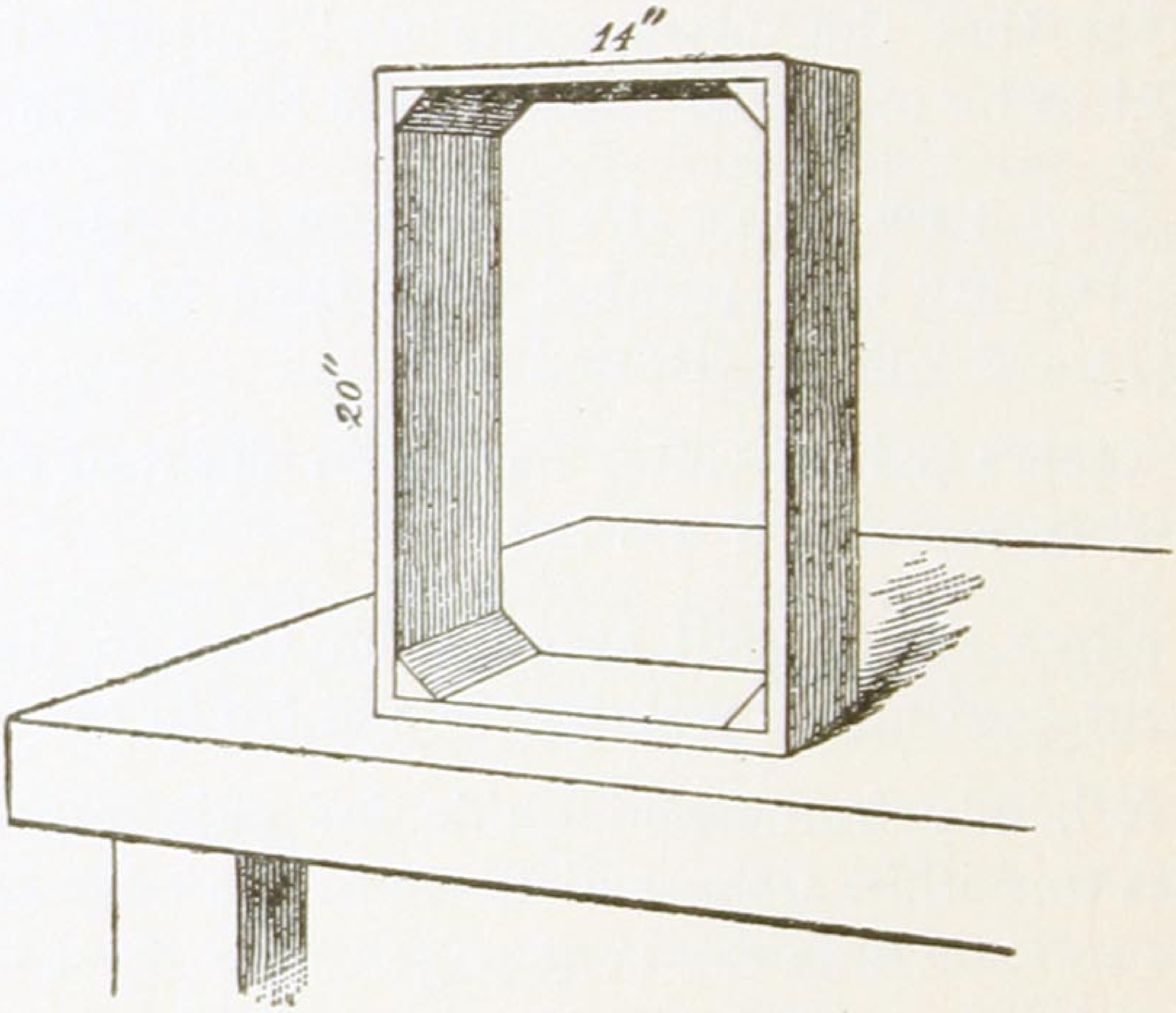

Fig. B. Guide for protecting edges

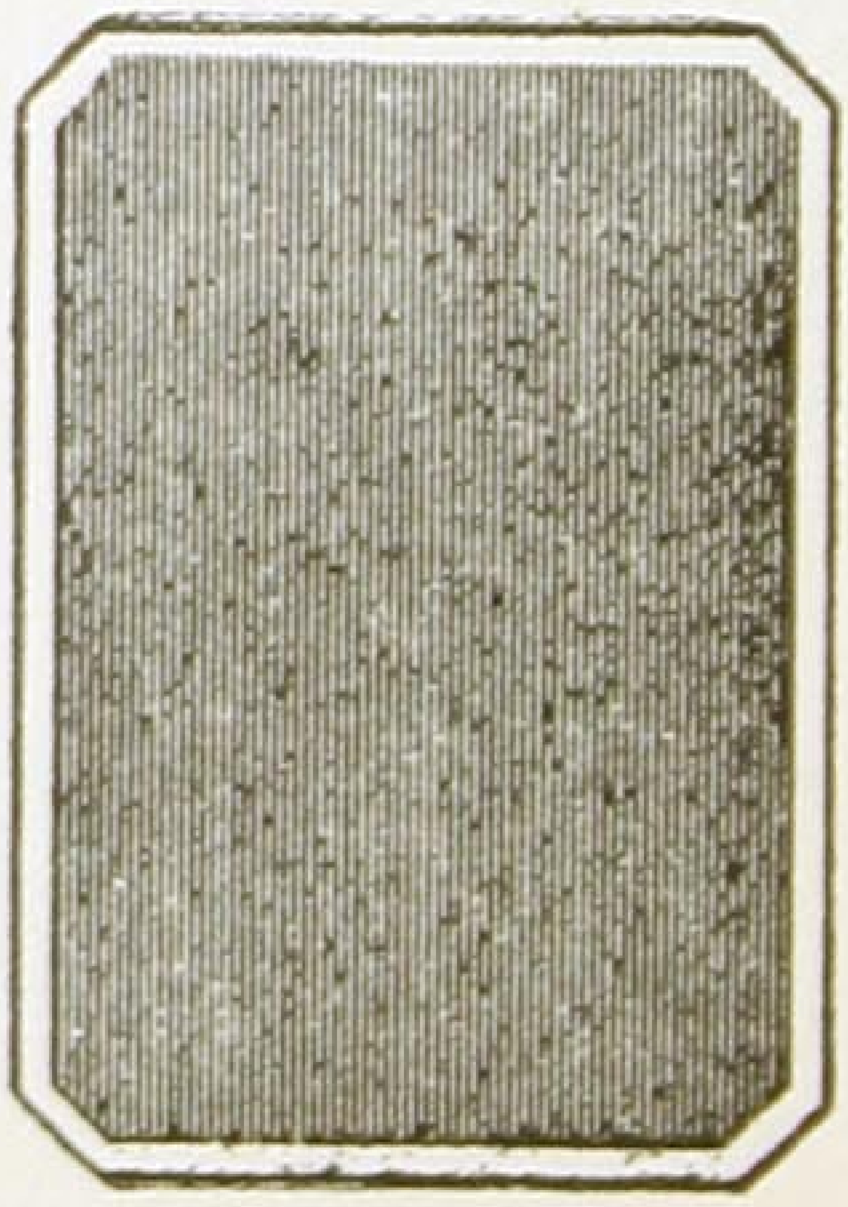

Fig. C. The painted sheet

An inexpensive guide for use in notching the corners can be made as illustrated below (Fig. D).

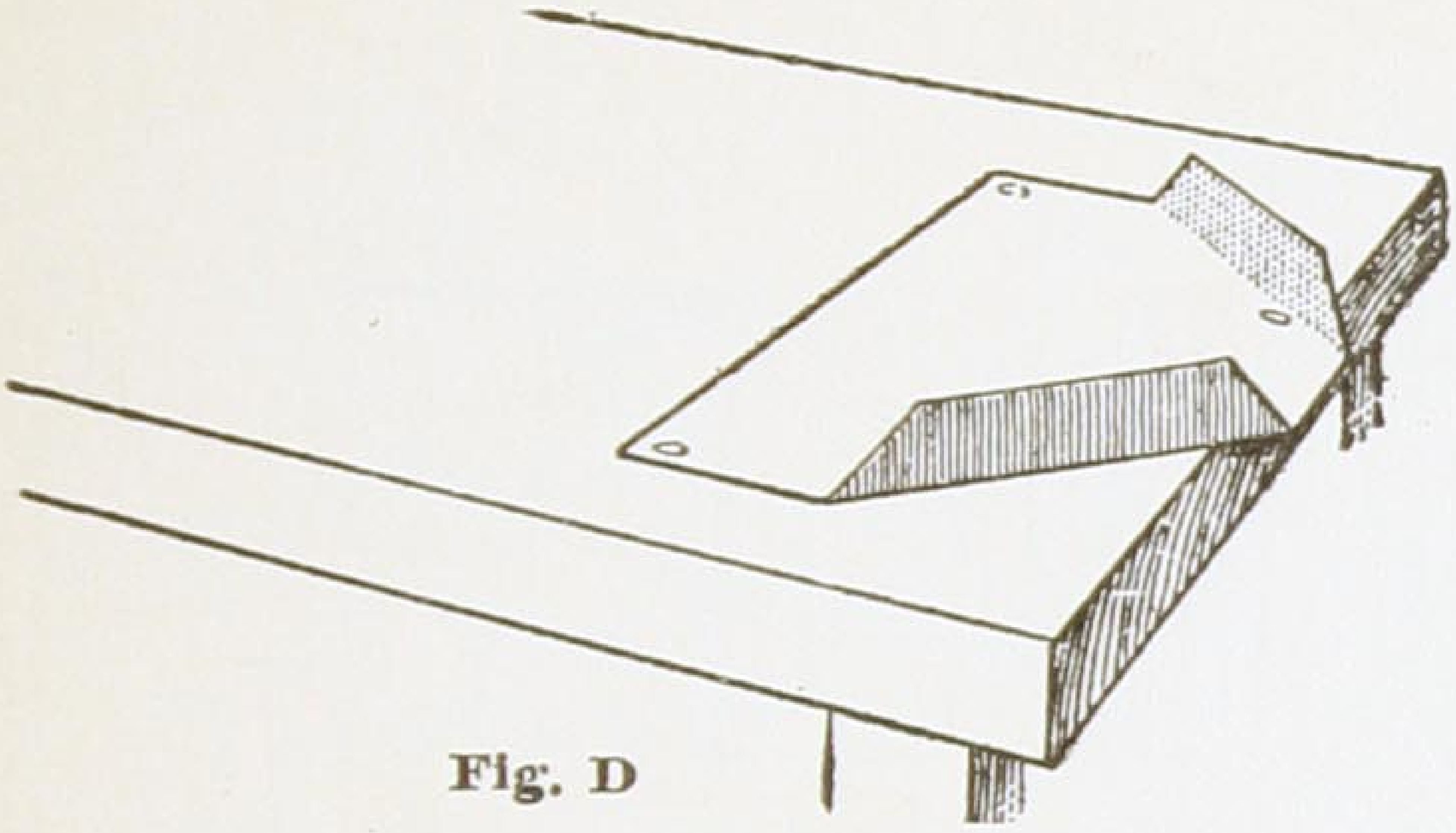

Fig. D

A cone of tin makes a useful rosin-spreader, particularly in windy weather. (See Fig. E.)

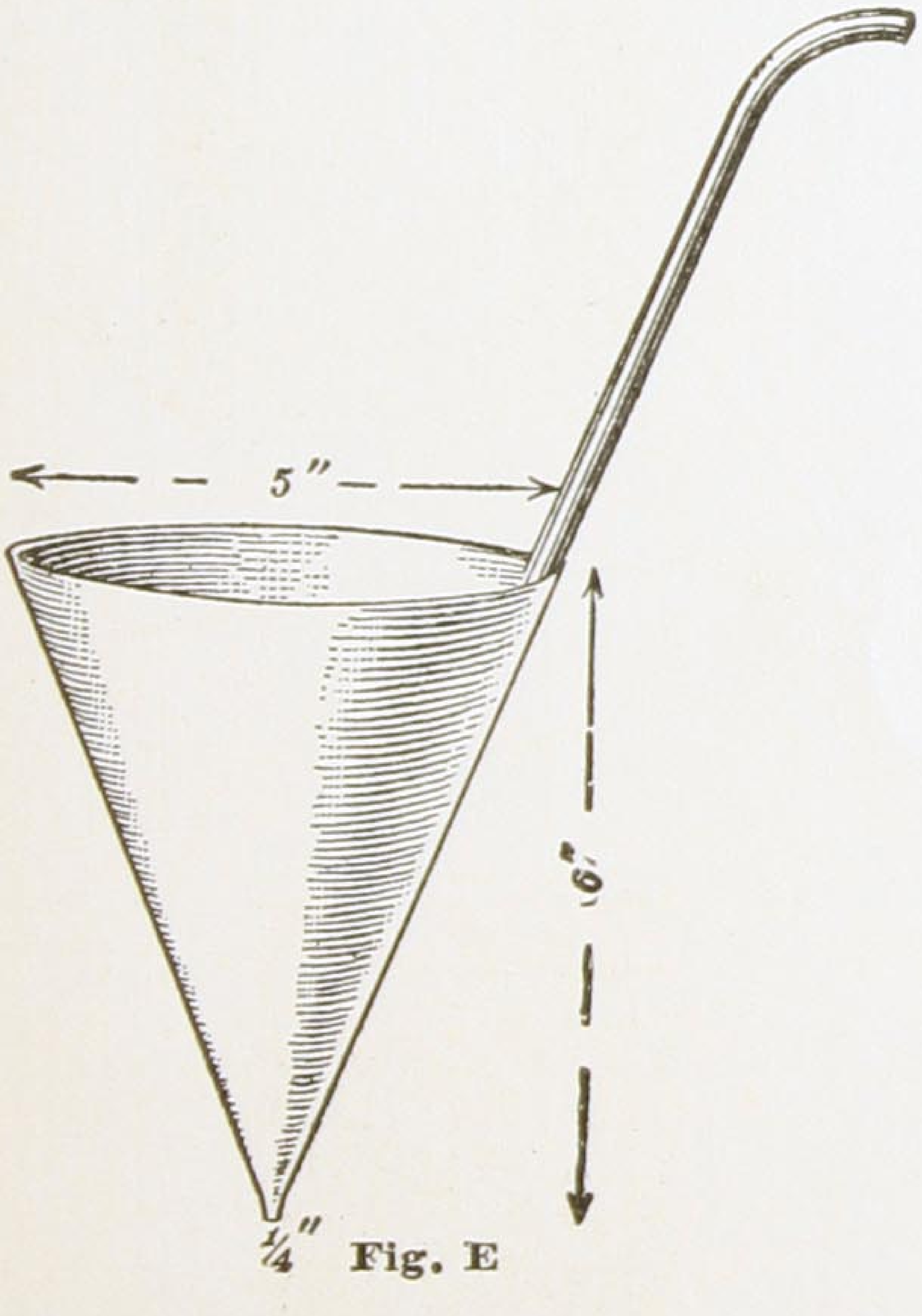

Fig. E

Experience has shown that there is galvanic action between tin and copper, or galvanized iron and copper. If possible, avoid joining these metals together.

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